

TBZ500 Z-Wave Plus Specification

Product: TBZ500

Customer: RCS

Date	Doc Rev	Firmware Version	Description
8/28/18	A		1) First Draft – Copied from TBZ48 spec. Z-Wave Plus features added
3/23/19	B	2.03.00	1) Updated spec for Humidity
6/26/19	C	2.03.00	1) Added note for reset. 2) Added RH Config Registers. 3) Corrected ProductTypeID and ProductID
7/01/19	D	2.03.00	1) Corrected Z-Wave+ to Z-Wave Plus
7/24/19	E	2.04.01	1) Add FC Change Configuration Report to autosend 2) Change autosend enable bits
10/14/19	F	2.07.03	1) Corrected Max Heat and Min Cool Setpoint values 2) Correct PRODUCTID2 – 0x543A
11/8/19	G	2.08.01	1) Update Backlight Timer default from 20 to 10 2) Update Temperature Delta Autosend Threshold from 2 to 1 3) Remove unused Setback Mode configuration item
11/22/19	H	2.08.03	1) Update Battery Radio cutoff default from 10 to 20 2) Update Battery LOWBATT Threshold from 20 to 30
12/09/19	I	2.08.04	1) Alphabetize the command classes 2) Change COMMAND_DEVICE_RESET_LOCALLY to COMMAND_CLASS_DEVICE_RESET_LOCALLY and add description 3) For COMMAND_CLASS_ASSOCIATION_V2 - correct configuration parameter note to parameter #23 4) Add COMMAND_CLASS_SENSOR_MULTILEVEL_V5 to the additional support class list in the Introduction section
01/31/19	J	2.08.06	1) Update Backlight Timer setting to show that a setting of 0 for always on is allowed if the thermostat is on AC power.
03/17/20	K	2.09.02	1) Updated the command class formatting in the document. 2) Updated the Configuration parameters table to reflect the most up to date parameters
3/25/20	L	2.09.04	1) Remove Away CSP and Away HSP from SETUP menu 2) Remove config register 38 - not supported 3) Fix the factory reset instructions 4) Fix the "Auto node" typo to "Auto mode" 5) "Occupied Mode" removed from COMMAND_CLASS_ASSOCIATION_V2 - not supported. 6) Remove "NOTE: Thermostat related Z-Wave commands sent to the TBZ500 will not generate an alert."
04/01/20	M	2.09.07	1) Updating the product ID to 0x5439 2) Adding COMMAND_CLASS_DEVICE_RESET_LOCALLY command class in the document. 3) Updated COMMAND_CLASS_FIRMWARE_UPDATE_MD_V3

Date	Doc Rev	Firmware Version	Description
4/08/20	N	3.00.01	1) Add note that Z-Wave autosend messaging will be temporarily disabled during OTA updates.
4/28/20	O	3.00.04	1) Add S2 related command classes. 2) Add SmartStart inclusion info
5/21/20	P	3.00.07	1) Including Antitheft Section

Overview	5
Z-Wave® Installation.....	5
Classic Inclusion:	5
SmartStart Inclusion:.....	6
Introduction.....	7
Explorer Frames.....	7
Association Alerts.....	7
Thermostat Info Screen.....	7
TBZ500 Menus.....	8
TBZ500 Installer Menu	8
Factory Reset.....	8
COMMAND CLASSES.....	9
COMMAND_CLASS_BASIC	9
Basic Get Command.....	9
Basic Report	9
Basic Set Command	9
COMMAND_ZWAVEPLUS_INFO_V2	9
Z-Wave Plus Info Get Command.....	9
Z-Wave Plus Info Report.....	10
COMMAND_CLASS_ANTITHEFT_V2	10
COMMAND_CLASS_ASSOCIATION_GRP_INFO	10
Association Group Name Get	11
Association Group Name Report	11
Association Group Info Get.....	11
Association Group Info Report.....	12
Association Group Command List Get	12
Association Group Command List Report	13
COMMAND_CLASS_ASSOCIATION_V2.....	13
Association Set Command	14
Association Get Command	14
Association Report Command	14
Association Supported Groupings Get Command.....	14
Association Supported Groupings Report	15
Association Remove Command	15
Association Specific Group Get Command	15
Association Specific Group Report	15
COMMAND_CLASS_BATTERY	16
Battery Level Get Command	16
Battery Level Report	16
COMMAND_CLASS_DEVICE_RESET_LOCALLY	16
COMMAND_CLASS_FIRMWARE_UPDATE_MD_V3	16
Firmware Meta Data Get Command.....	16
Firmware Meta Data Report	17
COMMAND_CLASS_MANUFACTURER_SPECIFIC_V2	18
Device Specific Get Command.....	18
Device Specific Report.....	18
Manufacturer Specific Get Command.....	18
Manufacturer Specific Report	19
COMMAND_CLASS_MULTI_CMD.....	19
Multi Command Encapsulated Command	19
COMMAND_CLASS_POWER_LEVEL.....	20
Powerlevel Set Command	20
Powerlevel Get Command	21
Powerlevel Report Command.....	21
Powerlevel Test Node Set Command.....	21
Powerlevel Test Node Get Command	21
Powerlevel Test Node Report.....	22
COMMAND_CLASS_SENSOR_MULTILEVEL_V5	22
Multilevel Sensor Get Command	22

Multilevel Sensor Report.....	22
Multilevel Sensor Get Supported Sensor Command.....	23
Multilevel Sensor Supported Sensor Report Command.....	23
Multilevel Sensor Get Supported Scale Command.....	23
Multilevel Sensor Supported Scale Report.....	23
COMMAND_CLASS_THERMOSTAT_FAN_MODE.....	24
Thermostat Fan Mode Supported Get Command.....	24
Thermostat Fan Mode Supported Report.....	24
Thermostat Fan Mode Set Command.....	24
Thermostat Fan Mode Get Command.....	24
Thermostat Fan Mode Report Command.....	24
COMMAND_CLASS_THERMOSTAT_FAN_STATE.....	25
Thermostat Fan State Get Command.....	25
Thermostat Fan State Report.....	25
COMMAND_CLASS_THERMOSTAT_MODE_V3.....	25
Thermostat Mode Supported Get Command.....	25
Thermostat Mode Supported Report.....	25
Thermostat Mode Set Command.....	26
Thermostat Mode Report.....	26
COMMAND_CLASS_THERMOSTAT_OPERATING_STATE_V2.....	26
Thermostat Operating State Get Command.....	26
Thermostat Operating State Report.....	27
COMMAND_CLASS_THERMOSTAT_SETPOINT_V3.....	27
Thermostat Setpoint Supported Get Command.....	27
Thermostat Setpoint Supported Report.....	27
Thermostat Setpoint Get Command.....	27
Thermostat Setpoint Report.....	28
Thermostat Setpoint Set Command.....	28
Thermostat Setpoint Report.....	29
Thermostat Setpoint Capabilities Get Command.....	29
Thermostat Setpoint Capabilities Report.....	30
COMMAND_CLASS_DEVICE_RESET_LOCALLY.....	30
COMMAND_CLASS_VERSION_V2.....	31
Version Get Command.....	31
Version Report Command.....	31
COMMAND_CLASS_SECURITY_2.....	32
COMMAND_CLASS_TRANSPORT_SERVICE_V2.....	32
COMMAND_CLASS_SUPERVISION.....	32
COMMAND_CLASS_CONFIGURATION_V2.....	33
Configuration Set Command.....	33
Configuration Get Command.....	34
Configuration Report.....	34
Configuration Bulk Set Command.....	34
Configuration Bulk Get Command.....	35
Configuration Bulk Report.....	37

Overview

The TBZ500 is Z-Wave Plus Thermostat.

Z-Wave® Installation

Z-Wave controllers from various manufacturers support the Z-Wave process of adding or removing a device from a network. The TBZ500 is a Z-Wave Slave and a Z-Wave controller is required as the primary controller to setup and maintain the network. **A security enabled Z-Wave controller must be used in order to fully utilize this product.**

A Z-Wave® network is a collection of Z-Wave® modules in a mesh type of network. Each Z-Wave® module, regardless of manufacturer, communicates with other modules within range to route and repeat the signals from one device to the next, this creates a highly reliable and robust transmission throughout the home. In addition, the network becomes stronger as more modules are added.

The following procedure will allow the TBZ500 to be included or removed from a Z-Wave network.

Inclusion: Adding the TBZ500 into an Existing Network:

Classic Inclusion:

1. **Set your primary controller to Include mode**, to add the TBZ500 as a node on your network (see your controller's user manual for detailed instructions).
2. **Press the FAN button and hold until the screen changes to the SETUP screen.**
3. **Press the UP button until the ZWAVE is shown on the status line, press Select.**
4. **INSTALL should be shown on the status line, press Select.** The status line will show the progress as the TBZ500 has been enrolled into a network. Wait until SUCCESS or FAILED is shown on the status line.
5. **Press Done to exit the ZWAVE screen.**
6. **Press Done again to exit the SETUP screen.** The Radio Icon should be shown indicating the TBZ500 is enrolled into a network.

Your controller will indicate the TBZ500 was successfully added to its network (see your controller's user manual for details). Also you can check if the TBZ500 was successfully added to the network by checking the ZHID (Home ID) and ZNID (Node ID) located in the **INFO** screen. *Inclusion and exclusion are always done at normal transmit power mode.*

If your controller supports NWI, then you can optionally set the primary to NWI include mode. Please note that NWI inclusion mode does not end when you have included a new node. This allows multiple nodes to be included without having to physically go back to the controller to initiate the next inclusion. Therefore, you must manually terminate NWI inclusion mode at the controller when you have finished including any new nodes to the network. Since intermediate included nodes will assist the inclusion process by routing messages, we recommend that nodes close to the primary controller be installed first, proceeding out in consecutive rings from the controller.

Note: Before adding the TBZ500 to a Z-Wave Network, check that it does not already belong to one by viewing the Home and Zone ID's located in the **INFO** screen. An un-configured TBZ500 should show a Node ID of 0 and a random Home ID, and not show the radio icon. Consult your controller's user manual for details on removing a device from a Z-Wave network.

SmartStart Inclusion:

Z-Wave SmartStart is designed to facilitate the inclusion of a single device or multiple devices simultaneously, enabled by the Provisioning List, and by storing unique end device DSKs in the gateway. By simply scanning the end device QR code before shipment to the end user, the Provisioning List is created in the gateway. This ensures that the gateway is ready to include the end device out of the box as soon as it is powered on, eliminating the need for any further user interaction on the end device. The order in which the devices are powered is irrelevant; the gateway will include them as long as they are on the Provisioning List.

If your TBZ500 has been pre-provisioned in the gateway, inclusion is initiated automatically on power-ON, and repeated at dynamic intervals for as long as the device is not included into a Z-Wave network. As the new device announces itself on power-ON, the protocol will provide notifications, and the gateway can initiate the inclusion process in the background, without the need for user interaction or any interruption of normal operation.

Note: The DSK can be obtained by either scanning the QR code on the back of the TBZ500 or by locating the DSK leaflet in the box. The first 5 digits of the DSK are also printed under the barcode on the back of the DSK.

Exclusion: Removing the TBZ500 from a Network:

1. **Set your primary controller to Remove mode**, to remove the TBZ500 as a node on your network (see your controller's user manual for detailed instructions).
2. **Press the FAN button and hold until the screen changes to the SETUP screen.**
3. **Press the UP button until the ZWAVE is shown on the status line, press Select.**
4. **REMOVE should be displayed, press Select.** The status line will show the progress as the TBZ500 has been removed from a network. Wait until SUCCESS or FAILED is shown on the status line.
5. **The controller will indicate the TBZ500 has been removed from the network.** The radio icon will disappear from the screen.

Introduction

This document is for the advanced user who has knowledge of the Z-Wave™ Command Classes and is able to initiate Z-Wave commands programmatically. The TBZ500 can operate as a FLiRS Device. If 24VAC is detected at the time of install the TBZ500 will be installed as a LISTENING node, otherwise it will be a NOT_LISTENING node if battery powered. When the TBZ500 sends a Node Info Report, it reports itself as:

GENERIC_TYPE_THERMOSTAT
SPECIFIC_TYPE_THERMOSTAT_GENERAL_V2

In addition to the mandatory command classes, it also supports:

- COMMAND_CLASS_ZWAVEPLUS_INFO_V2
- COMMAND_CLASS_ANTITHEFT_V2
- COMMAND_CLASS_ASSOCIATION_GROUP_INFO
- COMMAND_CLASS_ASSOCIATION_V2
- COMMAND_CLASS_BATTERY
- COMMAND_CLASS_CONFIGURATION_V2
- COMMAND_CLASS_DEVICE_RESET_LOCALLY
- COMMAND_CLASS_FIRMWARE_UPDATE_MD_V3
- COMMAND_CLASS_MANUFACTURER_SPECIFIC_V2
- COMMAND_CLASS_MULTI_CMD
- COMMAND_CLASS_SENSOR_MULTILEVEL_V5
- COMMAND_CLASS_POWER_LEVEL
- COMMAND_CLASS_THERMOSTAT_FAN_MODE
- COMMAND_CLASS_THERMOSTAT_FAN_STATE
- COMMAND_CLASS_THERMOSTAT_MODE_V3
- COMMAND_CLASS_THERMOSTAT_OPERATING_STATE_V2
- COMMAND_CLASS_THERMOSTAT_SETPOINT_V3
- COMMAND_CLASS_VERSION_V2
- COMMAND_CLASS_SECURITY
- COMMAND_CLASS_SECURITY_2
- COMMAND_CLASS_TRANSPORT_SERVICE_V2
- COMMAND_CLASS_SUPERVISION

Explorer Frames

The TBZ500 supports Explorer Frames.

Association Alerts

The TBZ500 supports 3 groups and 5 associations per group. See COMMAND_CLASS_ASSOCIATION for more detailed information.

Thermostat Info Screen

The TBZ500 Thermostat Info Screen will display current Z-Wave information including Node ID, Home ID and Z-Wave firmware revision. Also displays the System Type, Changeover Type, Fan Type, Battery Level, and primary firmware version in the info screen.

TBZ500 Menus

The TBZ500 Menu is accessed by holding down the Fan button for 3 seconds.

The Menu items are:

SETUP	–	F/C, Backlight Timeout, SensorCal, Status Line
SYSTEM	–	System Type, ChangeOver –or- Fan Type, (Hidden Installer Menu)
ZWAVE	–	Install, Remove
CLOCK	–	Day, Time
INFO	–	Model, Version, Z-Wave Version, Node ID, Home ID, System Type, C/O or Fan Type, Battery Level

TBZ500 Installer Menu

The TBZ500 Installer Menu is accessed by holding down the FAN and DOWN button for 3 seconds when in the main menu.

Factory Reset

Please use this procedure only when the Z-Wave Primary Controller is missing or otherwise inoperable.

To reset the TBZ500's Z-Wave parameters to Factory Settings (both Z-Wave and HVAC settings):

1. Remove power from the TBZ500.
2. Restore power to the TBZ500.
3. When "TBZ500" appears on the screen, hold down the MODE and FAN buttons at the same time.
4. Release the buttons when RESET appears on the Status Line.
5. Once the TBZ500 resets the Z-Wave and HVAC settings, a DONE confirmation message will appear on the screen before the thermostat self-reboots.

COMMAND CLASSES

COMMAND_CLASS_BASIC

Basic Get Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_BASIC							
Command = BASIC_GET							

This command should return basic report.

Basic Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_BASIC							
Command = BASIC_REPORT							
Value							

Value = 0x00 (Off mode)
0xFF (Auto mode)

Basic Set Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_BASIC							
Command = BASIC_SET							
Value							

Value = 0x00 (Off mode)
0xFF (Auto mode)

Basic Set thermostat function

When the thermostat receives a **BASIC_SET OFF (0x00)**:

- Changes from the **current operating mode** to the “off mode”.

When the thermostat receives a **BASIC_SET AUTO (0xFF)**:

- Changes from the **current operating mode** to the “auto mode”.

COMMAND_ZWAVEPLUS_INFO_V2

Z-Wave Plus Info Get Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ZWAVEPLUS_INFO							
Command = ZWAVEPLUS_INFO_GET							

Z-Wave Plus Info Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ZWAVEPLUS_INFO							
Command = ZWAVEPLUS_INFO_REPORT							
Z-Wave Plus Version							
Role Type							
Node Type							
Installer Icon Type MSB							
Installer Icon Type LSB							
User Icon Type MSB							
User Icon Type LSB							

Z-Wave Plus Version = 1
Role Type = ROLE_TYPE_SLAVE_SLEEPING_LISTENING (installed on battery)
 ROLE_TYPE_SLAVE_ALWAYS_ON (installed on 24VAC)
Node Type = NODE_TYPE_ZWAVEPLUS_NODE
Installer Icon Type MSB = 0x12 (ICON_TYPE_GENERIC_THERMOSTAT_HVAC)
Installer Icon Type LSB = 0x00 (ICON_TYPE_GENERIC_THERMOSTAT_HVAC)
User Icon Type MSB = 0x12 (ICON_TYPE_GENERIC_THERMOSTAT_HVAC)
User Icon Type LSB = 0x00 (ICON_TYPE_GENERIC_THERMOSTAT_HVAC)

COMMAND_CLASS_ANTITHEFT_V2

The Anti-theft Command Class is used to disable application specific command classes of the TBZ500 if it is excluded and then later included in a different network.

You can lock or unlock the TBZ500 by sending the set command with the correct magic code. This can be sent from any network to unlock the TBZ500 as long as the magic code is correct.

In a locked-out state, the TBZ500 will have limited functionality, only using the unsecure list of command classes (which can be found in the security section of this document). When unlocked, the TBZ500 will return to normal operating condition.

COMMAND_CLASS_ASSOCIATION_GRP_INFO

Information on groups and association.

Group	Profile	CC & C List	Group Name
1	General:Lifeline	BATTERY_REPORT DEVICE_RESET_LOCALLY_NOTIFICATION SENSOR_MULTILEVEL_REPORT THERMOSTAT_SETPOINT_REPORT THERMOSTAT_SETPOINT_MODE THERMOSTAT_FANMODE_REPORT THERMOSTAT_FANSTATE_REPORT THERMOSTAT_OPERATINGSTATE_REPORT THERMOSTAT_CONFIGURATION_REPORT	Lifeline
2	Control:Cool	BASIC_SET	Cool Control
3	Control:Heat	BASIC_SET	Heat Control

Association Group Name Get

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ASSOCIATION_GRP_INFO							
Command = ASSOCIATION_GROUP_NAME_GET							
Grouping Identifier							

Association Group Name Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ASSOCIATION_GRP_INFO							
Command = ASSOCIATION_GROUP_NAME_REPORT							
Grouping Identifier							
Name Length							
Name 1							
...							
Name N							

Grouping Identifier = This field is used to advertise the actual association group identifier.

Name Length = This field indicates the length in bytes of the Name field. The value MUST be in the range 0 to 42.

Name = This field is used to indicate the assigned name for the actual Group Identifier.

Association Group Info Get

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ASSOCIATION_GRP_INFO							
Command = ASSOCIATION_GROUP_INFO_GET							
Refresh cache	List Mode	Reserved					
Grouping Identifier							

Refresh Cache = 0

Reserved = 0

List Mode = 1 (The receiving node must ignore the Grouping Identifier field and return the properties of all its supported associations groups.)
= 0 (The receiving node MUST advertise the properties of the association group identified by the Grouping Identifier)

Grouping Identifier = This field is used to specify the requested association group identifier. This value must be ignored if the List Mode field is set to 1.

Association Group Info Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ASSOCIATION_GRP_INFO							
Command = ASSOCIATION_GROUP_INFO_REPORT							
List mode	Dynamic Info	Group Count					
Grouping Identifier							
Mode = 0							
Profile MSB							
Profile LSB							
Reserved = 0							
Event Code MSB = 0							
Event Code LSB = 0							
...							
Grouping Identifier							
Mode = 0							
Profile MSB							
Profile LSB							
Reserved = 0							
Event Code MSB = 0							
Event Code LSB = 0							

Dynamic Info = 0 (No dynamic information)

Group Count = 1 (One report per group)

Association Group Command List Get

This command is used to request the commands that are sent via a given association group.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ASSOCIATION_GRP_INFO							
Command = ASSOCIATION_GROUP_COMMAND_LIST_GET							
Allow cache	Reserved						
Grouping Identifier							

Allow cache = 0

Reserved = 0

Grouping Identifier = This field is used to specify the requested association group identifier.

Association Group Command List Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ASSOCIATION_GRP_INFO							
Command = ASSOCIATION_GROUP_COMMAND_LIST_REPORT							
Grouping Identifier							
List Length							
Command Class 1 (1 or 2 bytes)							
Command 1							
...							
Command Class N (1 or 2 bytes)							
Command N							

List Length = This field advertises the length in bytes of the command list (Command Class & Command fields).

Command Class & Command = All command Classes are normal.

COMMAND_CLASS_ASSOCIATION_V2

The TBZ500 supports 3 groups and 5 associations per group.

Group 1 Association Alerts are to notify an associated device of a thermostat generated change. Thermostat generated changes are those changes that originate at or by the thermostat. The general classifications of thermostat generated changes are:

- User interface changes – Setpoints, Mode, Fan Mode
- Operational changes – Operating State, Fan State (See Configuration parameter #23 for details)
- COMMAND_CLASS_CONFIGURATION changes – See the COMMAND_CLASS_CONFIGURATION table for additional unsolicited alerts
- Setpoint Push – When a setpoint is pushed to maintain the HC-Delta separation
- Battery Status when the battery reaches the predefined Thresholds

Group 2 Association Alerts will send a BASIC_SET 0xFF when a Cool Call starts and a BASIC_SET 0x00 when the Cool Call ends

Group 3 Association Alerts will send a BASIC_SET 0xFF when a Heat Call starts and a BASIC_SET 0x00 when the Heat Call ends

Association Set Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ASSOCIATION							
Command = ASSOCIATION_SET							
Grouping Identifier							
NodeID 1							
..							
NodeID N							

Grouping Identifier = This field is used to specify the actual association group identifier.

Node ID = Node IDs that are to be added to the specified association group.

Association Get Command

This command is used to request the current destinations of a given association group.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ASSOCIATION							
Command = ASSOCIATION_GET							
Grouping Identifier							

Grouping Identifier = This field is used to specify the actual association group identifier.

Association Report Command

This command is used to advertise the current destinations of a given association group.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ASSOCIATION							
Command = ASSOCIATION_REPORT							
Grouping Identifier							
Max Nodes Supported							
Reports to Follow							
NodeID 1							
...							
NodeID N							

Grouping Identifier = This field is used to specify the actual association group identifier.

Max Nodes Supported = 5 (Max number of destinations supported by the advertised association group)

Reports to Follow = 0 (Nodes fit in one report)

Node ID = Node IDs that are to be added to the specified association group.

Association Supported Groupings Get Command

This command is used to request the number of association groups that this node supports.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ASSOCIATION							
Command = ASSOCIATION_GROUPINGS_GET							

Association Supported Groupings Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ASSOCIATION							
Command = ASSOCIATION_GROUPINGS_REPORT							
Supported Groupings							

Supported Groupings = The number of association groups that this node supports.

Association Remove Command

The Association Remove Command is used to remove Node ID destinations from a given association group.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ASSOCIATION							
Command = ASSOCIATION_REMOVE							
Grouping Identifier							
NodeID 1							
...							
NodeID N							

Grouping Identifier = This field is used to specify the actual association group identifier.
Node ID = Node IDs that are to be added to the specified association group.

Association Specific Group Get Command

This command allows a portable controller to interactively create associations from a multi-button device to a destination that is out of direct range.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ASSOCIATION							
Command = ASSOCIATION_SPECIFIC_GROUP_GET							

Association Specific Group Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_ASSOCIATION							
Command = ASSOCIATION_SPECIFIC_GROUP_REPORT							
Group							

Group = 0

COMMAND_CLASS_BATTERY

Battery Level Get Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_BATTERY							
Command = BATTERY_GET							

Battery Level Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_BATTERY							
Command = BATTERY_REPORT							
Battery Level							

Battery Level = 0x00 to 0x64(0 to 100%)
0xFF (Critical battery code)

COMMAND_CLASS_DEVICE_RESET_LOCALLY

A Device Reset Locally notification is sent when the thermostat is reset to the factory default settings. The factory default reset can be done by initiating the Factory Reset procedure.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_DEVICE_RESET_LOCALLY							
Command = DEVICE_RESET_LOCALLY_NOTIFICATION							

Note: Please use this procedure only when the Z-Wave Primary Controller is missing or otherwise inoperable.

COMMAND_CLASS_FIRMWARE_UPDATE_MD_V3

The Firmware update command class allows updating firmware in the MSP430 micro. The firmware OTA process will only work if the battery capacity is > 50%.

Note: Z-Wave autosend messaging will be temporarily disabled during OTA updates.

Firmware Meta Data Get Command

The Firmware Meta Data Get Command is used to request information on the current firmware in the device.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_FIRMWARE_UPDATE_MD							
Command = FIRMWARE_MD_GET							

Firmware Meta Data Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_FIRMWARE_UPDATE_MD							
Command = FIRMWARE_MD_REPORT							
Manufacturer ID 1							
Manufacturer ID 2							
Firmware 0 ID 1							
Firmware 0 ID 2							
Firmware 0 Checksum 1							
Firmware 0 Checksum 2							
Firmware Upgradable							
Number of Firmware Targets							
Max Fragment Size 1							
Max Fragment Size 2							
Firmware 1 ID 1							
Firmware 1 ID 2							
...							
Firmware N ID 1							
Firmware N ID 2							

- Manufacturer ID** = unique 16-bits ID identifying the manufacturer of the device.
- Firmware 0 ID** = The Firmware 0 ID field is dedicated to target 0, i.e. the Z-Wave chip.
- Firmware 0 Checksum** = Used to ensure consistency of the Firmware 0 image currently in the device. It is implemented using a CRC-CCITT polynomial (initialization value equal to 0x1D0F and 0x1021).
- Firmware Upgradable** = This field defines whether the Z-Wave chip is firmware upgradable.
- Number of Firmware Targets** = The number of firmware IDs following this field. The Firmware 0 ID field is not included.
- Max Fragment Size** = Report the max number of Data bytes that a device can receive at a time.

NOTE: Refer to the TBZ500 Z-Wave Over the Air Update Spec for details on this command class.

COMMAND_CLASS_MANUFACTURER_SPECIFIC_V2

Device Specific Get Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_MANUFACTURER_SPECIFIC							
Command = DEVICE_SPECIFIC_GET							
Reserved				Device ID Type			

Reserved = 0

Device ID type = 1 (Serial number)

Device Specific Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_MANUFACTURER_SPECIFIC							
Command = DEVICE_SPECIFIC_REPORT							
Reserved					Device ID Type		
Device ID Data Format			Device ID Data Length				
Device ID Data 1							
...							
Device ID Data N							

Device ID type = 1 (Serial number)

Device ID Data Format = 1 (Binary)

Device ID Data length = 13

Device ID = 13 bytes of serial number

Manufacturer Specific Get Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_MANUFACTURER_SPECIFIC							
Command = MANUFACTURER_SPECIFIC_GET							

Manufacturer Specific Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_MANUFACTURER_SPECIFIC							
Command = MANUFACTURER_SPECIFIC_REPORT							
Manufacturer ID 1							
Manufacturer ID 2							
Product Type ID 1							
Product Type ID 2							
Product ID 1							
Product ID 2							

Manufacturer ID 1 = 0x00

Manufacturer ID 2 = 0x10

Product Type ID 1 = 0x54 ('T')

Product Type ID 2 = 0x42 ('B')

Product ID 1 = 0x54 ('T')

Product ID 2 = 0x39 ('9')

COMMAND_CLASS_MULTI_CMD

The MULTI_CMD command class allows the TBZ500 to send multiple Z-Wave commands in one packet. This allows the TBZ500 to send/receive update commands quickly, using less battery power.

Multi Command Encapsulated Command

This command encapsulates multiple standard commands in one packet. In general, there is no menu item for this command class on a Z-Wave controller. This command class is used as a background function behind the other command classes. The encapsulated Commands must be executed in the order they are received. In case Get type Commands in a Multi Command Encapsulated Command are received by a device, the Report type Commands must be returned in the same order as the Get type Commands were received.

Each block carrying an encapsulated command MUST comprise the following fields:

- Command length
- Command Class
- Command
- Data

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_MULTI_CMD							
Command = MULTI_CMD_ENCAP (0x01)							
Number of Commands							
Command Length 1							
Command Class 1 (1 or 2 bytes)							
Command 1							
Data 1,1							
...							
Data 1,N							
...							
Command Length X							
Command Class X (1 or 2 bytes)							
Command X							
Data X,1							
...							
Data X,N							

COMMAND_CLASS_POWER_LEVEL

Powerlevel Set Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_POWERLEVEL							
Command = POWERLEVEL_SET							
Power level							
Timeout							

Power Level = 0x00 (Normal Power)

- 0x01 (Minus 1dBm)
- 0x02 (Minus 2dBm)
- 0x03 (Minus 3dBm)
- 0x04 (Minus 4dBm)
- 0x05 (Minus 5dBm)
- 0x06 (Minus 6dBm)
- 0x07 (Minus 7dBm)
- 0x08 (Minus 8dBm)
- 0x09 (Minus 9dBm)

Timeout = 1-255 (Seconds)

Powerlevel Get Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_POWERLEVEL							
Command = POWERLEVEL_GET							

Powerlevel Report Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_POWERLEVEL							
Command = POWERLEVEL_REPORT							
Power level							
Timeout							

Powerlevel Test Node Set Command

Instructs the destination node to transmit several test frames to the specified node with the RF power level specified.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_POWERLEVEL							
Command = POWERLEVEL_TEST_NODE_SET							
Test NodeID							
Power level							
Test frame count (MSB)							
Test frame count (LSB)							

Powerlevel Test Node Get Command

This command is used to request the result of the latest Powerlevel Test.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_POWERLEVEL							
Command = POWERLEVEL_TEST_NODE_GET							

Powerlevel Test Node Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_POWERLEVEL							
Command = POWERLEVEL_TEST_NODE_REPORT							
Test NodeID							
Status of operation							
Test frame acknowledged count (MSB)							
Test frame acknowledged count (LSB)							

COMMAND_CLASS_SENSOR_MULTILEVEL_V5

The TBZ500 supports a temperature sensor and humidity sensor accessed through the multilevel sensor command class.

Multilevel Sensor Get Command

The TBZ500 will respond with the default V1 Temperature SENSOR REPORT (scale = F, size = 1) for the following conditions:

- “Multilevel Sensor Get Command” for all versions before V5.
- “Multilevel Sensor Get Command” with an unsupported sensor type
- “Multilevel Sensor Get Command” with supported Sensor type and unsupported scale

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_SENSOR_MULTILEVEL							
Command = SENSOR_MULTILEVEL_GET							

Multilevel Sensor Report

If the originating Node ID of the “Multilevel Sensor Report” matches one of the remote sensor node numbers, that value will be used as the remote sensor’s value.

Temperature packet:

7	6	5	4	3	2	1	0
COMMAND_CLASS SENSOR_MULTILEVEL_V5							
SENSOR_MULTILEVEL_REPORT							
Sensor Type = 0x01 (Temperature)							
Precision			Scale			Size	
000 (F)			00 (C)			001	
001 (C)			01 (F)				
Temperature Value							

Humidity packet:

7	6	5	4	3	2	1	0
COMMAND_CLASS SENSOR_MULTILEVEL_V5							
SENSOR_MULTILEVEL_REPORT							
Sensor Type = 0x05 (Humidity)							
Precision			Scale			Size	
000			00 (Percent)			001	
RH Value in percent							

Multilevel Sensor Get Supported Sensor Command

This command is used to request the supported Sensor Types from a supporting node.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_SENSOR_MULTILEVEL							
Command = SENSOR_MULTILEVEL_SUPPORTED_GET_SENSOR							

Multilevel Sensor Supported Sensor Report Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_SENSOR_MULTILEVEL							
Command = SENSOR_MULTILEVEL_SUPPORTED_SENSOR_REPORT							
Bit Mask 1							
...							
Bit Mask N							

Bit Mask 1 = 0x11 (Bit 0 = Temperature, Bit 1 = Humidity)

Multilevel Sensor Get Supported Scale Command

This command is used to retrieve the supported scales of the specific sensor type from the Multilevel Sensor device.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_SENSOR_MULTILEVEL							
Command = SENSOR_MULTILEVEL_SUPPORTED_GET_SCALE							
Sensor Type							

Sensor Type = 0x01 (Temperature sensor)
= 0x05 (Humidity sensor)

Multilevel Sensor Supported Scale Report

This field is used to advertise the supported scales for the actual sensor type.

Temperature packet:

7	6	5	4	3	2	1	0
COMMAND_CLASS_SENSOR_MULTILEVEL_V5							
SENSOR_MULTILEVEL_SUPPORTED_SCALE_REPORT							
Sensor Type = 0x01 (Temperature Sensor)							
0	0	0	0	Scale bit mask 0x03 for C & F			

Humidity packet:

7	6	5	4	3	2	1	0
COMMAND_CLASS_SENSOR_MULTILEVEL_V5							
SENSOR_MULTILEVEL_SUPPORTED_SCALE_REPORT							
Sensor Type = 0x05 (Humidity Sensor)							
0	0	0	0	Scale bit mask 0x01 Percentage value			

COMMAND_CLASS_THERMOSTAT_FAN_MODE

Thermostat Fan Mode Supported Get Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_FAN_MODE							
Command = THERMOSTAT_FAN_MODE_SUPPORTED_GET							

Thermostat Fan Mode Supported Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_FAN_MODE							
Command = THERMOSTAT_FAN_MODE_SUPPORTED_REPORT							
Bit Mask 1							
...							
Bit Mask N							

The Bit Mask fields describe the supported fan modes by the thermostat.

- Bit 0 in Bit Mask 1 indicates if Fan Mode = 0 (Auto / Auto Low) is supported.
- Bit 1 in Bit Mask 1 indicates if Fan Mode = 1 (On / On Low) is supported.

Bit Mask 1 = 0x03 (Auto and Low modes supported)

Thermostat Fan Mode Set Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_FAN_MODE							
Command = THERMOSTAT_FAN_MODE_SET							
Reserved				Fan Mode			

Fan mode = 0x00(Auto)
0x01(On/Low)

Thermostat Fan Mode Get Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_FAN_MODE							
Command = THERMOSTAT_FAN_MODE_GET							

Thermostat Fan Mode Report Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_FAN_MODE							
Command = THERMOSTAT_FAN_MODE_REPORT							
Reserved				Fan Mode			

Fan Mode = 0x00 (Auto)
0x01 (On/Low)

COMMAND_CLASS_THERMOSTAT_FAN_STATE

Thermostat Fan State Get Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_FAN_STATE							
Command = THERMOSTAT_FAN_STATE_GET							

Thermostat Fan State Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_FAN_STATE							
Command = THERMOSTAT_FAN_STATE_REPORT							
Reserved				Fan Operating State			

Reserved = 0
Fan Operating State = 0x00 (Off)
0x01 (On)

COMMAND_CLASS_THERMOSTAT_MODE_V3

Thermostat Mode Supported Get Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_MODE (0x40)							
Command = THERMOSTAT_MODE_SUPPORTED_GET (0x04)							

Thermostat Mode Supported Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_MODE (0x40)							
Command = THERMOSTAT_MODE_SUPPORTED_REPORT (0x05)							
Bit Mask 1							
...							
Bit Mask N							

The Bit Mask fields describe the supported thermostat modes by the thermostat.

- Bit 0 in Bit Mask 1 indicates “off mode” is supported.
- Bit 1 in Bit Mask 1 indicates “heat mode” is supported.
- Bit 2 in Bit Mask 2 indicates “cool mode” is supported.
- Bit 3 in Bit Mask 3 indicates “auto mode” is supported.
- Bit 4 in Bit Mask 4 indicates “emergency mode” is supported.

Bit Mask 1 = 0x1F

Thermostat Mode Set Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_MODE (0x40)							
Command = THERMOSTAT_MODE_SET (0x01)							
No of Manufacturer Data fields			Mode				
Manufacturer Data 1							
...							
Manufacturer Data N							

Mode = 0x00 (off)
 0x01 (heat)
 0x02 (cool)
 0x03 (auto)
 0x04 (emergency heat)

Thermostat Mode Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_MODE (0x40)							
Command = THERMOSTAT_MODE_REPORT (0x03)							
No of Manufacturer Data fields			Mode				
Manufacturer Data 1							
...							
Manufacturer Data N							

Mode = 0x00 (off)
 0x01 (heat)
 0x02 (cool)
 0x03 (auto)
 0x04 (emergency heat)

COMMAND_CLASS_THERMOSTAT_OPERATING_STATE_V2

Thermostat Operating State Get Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_OPERATING_STATE							
Command = THERMOSTAT_OPERATING_STATE_GET							

Thermostat Operating State Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_OPERATING_STATE							
Command = THERMOSTAT_OPERATING_STATE_REPORT							
Reserved				Operating State			

Reserved = This field must be set to 0 by a sending node and must be ignored by a receiving node.

Operating state = 0x00 (OPERATINGSTATE_IDLE)
 0x01 (OPERATINGSTATE_HEAT)
 0x02 (OPERATINGSTATE_COOL)
 0x04 (OPERATINGSTATE_PENDINGHEAT)
 0x05 (OPERATINGSTATE_PENDINGCOOL)

COMMAND_CLASS_THERMOSTAT_SETPOINT_V3

Thermostat Setpoint Supported Get Command

This command is used to query the supported setpoint types. The TBZ500 supports 4 setpoints.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_SETPOINT (0x43)							
Command = THERMOSTAT_SETPOINT_SUPPORTED_GET (0x04)							

Thermostat Setpoint Supported Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_SETPOINT (0x43)							
Command = THERMOSTAT_SETPOINT_SUPPORTED_REPORT (0x05)							
Bit Mask 1							
...							
Bit Mask N							

Bit Mask 1 = 0x06 (Bit1 = Heat set point, Bit2 = Cool set point)

Thermostat Setpoint Get Command

This command is used to request the target value for a given setpoint type that is currently configured at a supporting node.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_SETPOINT (0x43)							
Command = THERMOSTAT_SETPOINT_GET (0x02)							
Reserved				Setpoint Type			

Thermostat Setpoint Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_SETPOINT (0x43)							
Command = THERMOSTAT_SETPOINT_REPORT (0x03)							
Reserved				Setpoint Type			
Precision			Scale		Size		
Value 1							
..							
Value N							

Reserved = 0

Set point type = 0x01 (Heat set point)

= 0x02 (Cool set point)

Precision = 0

Scale = 1

Size = 1

Value 1 = set point value

Thermostat Setpoint Set Command

This command is used to specify the target value for the specified Setpoint Type at a supporting node.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_SETPOINT (0x43)							
Command = THERMOSTAT_SETPOINT_SET (0x01)							
Reserved				Setpoint Type			
Precision			Scale		Size		
Value 1							
..							
Value N							

Reserved = 0

Set point type = 0x01 (Heat set point)

= 0x02 (Cool set point)

Precision = 0

Scale = 1

Size = 1

Value 1 = set point value

Thermostat Setpoint Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_SETPOINT (0x43)							
Command = THERMOSTAT_SETPOINT_REPORT (0x03)							
Reserved				Setpoint Type			
Precision			Scale		Size		
Value 1							
..							
Value N							

Reserved = 0

Set point type = 0x01 (Heat set point)
= 0x02 (Cool set point)

Precision = 0

Scale = 1

Size = 1

Value 1 = set point value

Thermostat Setpoint Capabilities Get Command

This command is used request the supported setpoint value range for an actual Setpoint Type.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_SETPOINT (0x43)							
Command = THERMOSTAT_SETPOINT_CAPABILITIES_GET (0x09)							
Reserved				Setpoint Type			

Set point type = 0x01 (Heat set point)
= 0x02 (Cool set point)

Thermostat Setpoint Capabilities Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_THERMOSTAT_SETPOINT (0x43)							
Command = THERMOSTAT_SETPOINT_CAPABILITIES_REPORT (0x09)							
Reserved				Setpoint Type			
Min Value Precision			Min Value Scale		Min Value Size		
Min Value 1							
..							
Min Value N							
Max Value Precision			Max Value Scale		Max Value Size		
Max Value 1							
..							
Max Value N							

When Set point type = 0x01 (Heat set point)

Reserved = 0
 Setpoint Type = 0x01 (Heat set point)
 Min Value Precision = 0
 Min Value Scale = 1
 Min Value Size = 1
 Min Value 1 = 0x28
 Max Value Precision = 0
 Max Value Scale = 1
 Max Value Size = 1
 Max Value 1 = 0x60

When Set point type = 0x02 (Cool set point)

Reserved = 0
 Setpoint Type = 0x02 (Cool set point)
 Min Value Precision = 0
 Min Value Scale = 1
 Min Value Size = 1
 Min Value 1 = 0x2B
 Max Value Precision = 0
 Max Value Scale = 1
 Max Value Size = 1
 Max Value 1 = 0x63

COMMAND_CLASS_DEVICE_RESET_LOCALLY

To factory restore the device, press and hold the fan and mode button when "TBZ500" appears at bootup. This will also trigger the device reset locally notification. It is used to advertise that the device will be reset to default.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_DEVICE_RESET_LOCALLY							
Command = DEVICE_RESET_LOCALLY_NOTIFICATION							

COMMAND_CLASS_VERSION_V2

Version Get Command

	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_VERSION							
Command = VERSION_GET							

Version Report Command

The Version Report Command is be used to advertise the library type, protocol version and application version from a device.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_VERSION							
Command = VERSION_REPORT							
Z-Wave Library Type							
Z-Wave Protocol Version							
Z-Wave Protocol Sub Version							
Application Version							
Application Sub Version							

Z-Wave Library Type = This field MUST carry the Z-Wave Protocol Library Type. Please refer table below.

Z-Wave Protocol Version & Z-Wave Protocol Sub Version = These fields advertise information specific to Software Development Kits (SDK)

Application Version = Manufacturer assigned the application version.

Application Sub Version = Manufacturer assigned the application sub version.

Library Type	Description	Version
0x00	N/A	-
0x01	Static Controller	1
0x02	Controller	1
0x03	Enhanced Slave	1
0x04	Slave	1
0x05	Installer	1
0x06	Routing Slave	1
0x07	Bridge Controller	1
0x08	Device Under Test (DUT)	1
0x09	N/A	1
0x0A	AV Remote	1
0x0B	AV Device	1

COMMAND_CLASS_SECURITY_2

At its highest security level, the TBZ500 will report itself as an Unauthenticated S2 Security device.

Unsecure Command Classes

COMMAND_CLASS_ZWAVEPLUS_INFO,
COMMAND_CLASS_ANTITHEFT_V2,
COMMAND_CLASS_SECURITY,
COMMAND_CLASS_SECURITY_2,
COMMAND_CLASS_TRANSPORT_SERVICE_V2,
COMMAND_CLASS_SUPERVISION,
COMMAND_CLASS_MULTI_CMD

Secure Command Classes

COMMAND_CLASS_ZWAVEPLUS_INFO,
COMMAND_CLASS_ANTITHEFT_V2,
COMMAND_CLASS_ASSOCIATION_GRP_INFO,
COMMAND_CLASS_ASSOCIATION_V2,
COMMAND_CLASS_DEVICE_RESET_LOCALLY,
COMMAND_CLASS_MANUFACTURER_SPECIFIC_V2,
COMMAND_CLASS_BATTERY,
COMMAND_CLASS_CONFIGURATION_V2,
COMMAND_CLASS_MULTI_CMD,
COMMAND_CLASS_POWERLEVEL,
COMMAND_CLASS_SENSOR_MULTILEVEL,
COMMAND_CLASS_FIRMWARE_UPDATE_MD_V3,
COMMAND_CLASS_THERMOSTAT_FAN_MODE,
COMMAND_CLASS_THERMOSTAT_FAN_STATE,
COMMAND_CLASS_THERMOSTAT_MODE_V3,
COMMAND_CLASS_THERMOSTAT_OPERATING_STATE_V2,
COMMAND_CLASS_NOTIFICATION_V8,
COMMAND_CLASS_THERMOSTAT_SETPOINT_V3,
COMMAND_CLASS_VERSION_V2

COMMAND_CLASS_TRANSPORT_SERVICE_V2

Supported.

COMMAND_CLASS_SUPERVISION

Supported.

COMMAND_CLASS_CONFIGURATION_V2

There are configuration parameters accessible via the COMMAND_CLASS_CONFIGURATION.

Note all temperature related parameters are in degrees F.

Sample commands:

To check unit System Type, send CONFIGURATION_GET, 1. Return is a 0 for Standard or 1 for HP.

Configuration Set Command

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_CONFIGURATION							
Command = CONFIGURATION_SET							
Parameter Number							
Default	Reserved					Size	
Configuration Value 1							
...							
Configuration Value N							

Parameter Number = Specify the actual configuration parameter.

Default = 0x00 (Use Configuration value)
0x01 (restore to default value)

Reserved = 0

Size = 1

Configuration Value 1 = Value to be assigned.

Configuration Get Command

This command is used to query the value of a configuration parameter.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_CONFIGURATION							
Command = CONFIGURATION_GET							
Parameter Number							

Example:

Parameter Number = 1

Configuration Report

This command is used to advertise the actual value of the advertised parameter.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_CONFIGURATION							
Command = CONFIGURATION_REPORT							
Parameter Number							
Reserved					Size		
Configuration Value 1							
..							
Configuration Value N							

Example:

Parameter Number = 1

Reserved = 0

Size = 1

**Configuration Value 1 = 0x00 (Standard)
0x01 (Heat pump)**

Configuration Bulk Set Command

This command is used to set the value of one or more configuration parameters.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_CONFIGURATION							
Command = CONFIGURATION_BULK_SET							
Parameter Offset 1 (MSB)							
Parameter Offset 2 (LSB)							
Number of Parameters							
Default	Hand-shake	Reserved				Size	
Parameter 1 – Configuration Value 1 (MSB)							
...							
Parameter 1 – Configuration Value N (LSB)							
...							
Parameter M – Configuration Value 1 (MSB)							
...							
Parameter M – Configuration Value N (LSB)							

- Parameter Offset** = Specify the first parameter in a range of parameters
- Number of Parameters** = Specify the number of configuration parameters contained in this command.
- Default** = 0x00 (Use Configuration value)
0x01 (restore to default value)
- Handshake** = Indicate if a Configuration Bulk Report Command is to be returned.
- Reserved** = 0
- Size** = Size of the actual parameters.
- Parameter** = Configuration Value (M*N bytes), these fields carry the values to be assigned.

Configuration Bulk Get Command

This command is used to query the value of one or more configuration parameters.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_CONFIGURATION							
Command = CONFIGURATION_BULK_GET							
Parameter Offset 1 (MSB)							
Parameter Offset 2 (LSB)							
Number of Parameters							

Parameter Offset = Specify the first parameter in a range of parameters
Number of Parameters = Specify the number of requested configuration parameters.

Configuration Bulk Report

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_CONFIGURATION							
Command = CONFIGURATION_BULK_REPORT							
Parameter Offset 1 (MSB)							
Parameter Offset 2 (LSB)							
Number of Parameters							
Reports to follow							
Default	Hand-shake	Reserved			Size		
Parameter 1 – Configuration Value 1 (MSB)							
...							
Parameter 1 – Configuration Value N (LSB)							
...							
Parameter M – Configuration Value 1 (MSB)							
...							
Parameter M – Configuration Value N (LSB)							

- Parameter Offset** = The first parameter in a range of parameters
- Number of Parameters** = The number of configuration parameters contained in this command.
- Default** = 0x00 (Use Configuration value)
0x01 (restore to default value)
- Handshake** = 0x00 (In response to a Configuration Bulk Get Command)
0x01 (parameters have been stored in non-volatile memory and that the sending node is ready to receive another Config Bulk Set Command)
- Reserved** = 0
- Size** = Size of the actual parameters.
- Parameter** = Configuration Value (M*N bytes), these fields carry the values to be assigned.

Config Parameter #	Description	Length (bytes)	Send Unsolicited on change	Default Value	Read values	Write values
1	System Type ⁴	1	N	0	0 = Standard 1 = Heat Pump	0 = Standard 1 = Heat Pump
2	Fan Type ⁴	1	N	0	0 = Gas (No fan w/Heat) 1 = Electric (Fan w/Heat)	0 = Gas (No fan w/Heat), 1 = Electric (Fan w/Heat)
3	Change Over Type ⁴	1	N	0	0 = CO w/cool 1 = CO w/heat	0 = CO w/cool 1 = CO w/heat
4	2 nd Stage Heat Enable ⁴	1	N	0	0 = Disabled 1 = Enabled	0 = Disabled 1 = Enabled
5	Aux Heat Enable ⁴	1	N	1	0 = Disabled 1 = Enabled	0 = Disabled 1 = Enabled
6	2 nd Stage Cool Enable ⁴	1	N	0	0 = Disabled 1 = Enabled	0 = Disabled 1 = Enabled
7	C/F Type	1	Y	1	0 = Centigrade 1 = Fahrenheit	0 = Centigrade 1 = Fahrenheit
8	MOT ⁵	1	N	5	5-9	5-9
9	MRT ⁵	1	N	3	3-9	3-9
10	Setpoint H/C Delta	1	N	3	3-15	3-15
11	H Delta Stage 1 ON	1	N	1	1-6	1-6
12	H Delta Stage 1 OFF	1	N	0	0-5	0-5
13	H Delta Stage 2 ON	1	N	2	2-7	2-7
14	H Delta Stage 2 OFF	1	N	0	0-6	0-6
15	H Delta Aux ON	1	N	3	3-8	3-8
16	H Delta Aux OFF	1	N	0	0-7	0-7
17	C Delta Stage 1 ON	1	N	1	1-6	1-6
18	C Delta Stage 1 OFF	1	N	0	0-5	0-5
19	C Delta Stage 2 ON	1	N	2	2-7	2-7
20	C Delta Stage 2 OFF	1	N	0	0-6	0-6
21 0x15	Mechanical Status ³	2	Y		MECH_H1 0x0001 MECH_H2 0x0002 MECH_H3 0x0004 MECH_C1 0x0008 MECH_C2 0x0010 PHANTOM_F 0x0020 MECH_F 0x0040 MANUAL_F 0x0080 reserved 0x0100	n/a

Config Parameter #	Description	Length (bytes)	Send Unsolicited on change	Default Value	Read values	Write values
22 0x16	SCP Status ³	1	Y		STATE_HEAT 0x01 STATE_COOL 0x02 STATE_2ND 0x04 STATE_3RD 0x08 STATE_FAN 0x10 STATE_LAST 0x20 STATE_MOT 0x40 STATE_MRT 0x80	n/a
23 0x17	Autosend Enable Bits When set, the corresponding report is sent out unsolicited when a changed is detected, to the nodes in the association list	2	N	0x305F	TEMPERATURE (CC_SENSOR_MULTILEVEL) 0x0001 SETPOINTH (CC_THERMOSTAT_SETPOINT) 0x0002 SETPOINTC (CC_THERMOSTAT_SETPOINT) 0x0004 MODE (CC_THERMOSTAT_MODE) 0x0008 FANMODE (CC_THERMOSTAT_FAN_MODE) 0x0010 FANSTATE (CC_THERMOSTAT_FAN_STATE) 0x0020 OPERATINGSTATE (CC_THERMOSTAT_OPERATING_STATE) 0x0040 0x0080 0x0100 0x0200 DISPLAYLOCK (CC_CONFIGURATION #24) 0x0400 0x0800 FC_CHANGE (CC_CONFIGURATION #7) 0x1000 BATTERY ⁶ (CC_BATTERY) 0x2000 MECH STATUS (CC_CONFIGURATION #21) 0x4000 SCP STATUS (CC_CONFIGURATION #22) 0x8000	
24	Display Lock ³	1	Y	0	0 = unlocked 1 =locked	0 = unlocked 1 = locked
26	Backlight Timer	1	N	10	0 ⁸ , 10-30	0 ⁸ , 10-30
33	Max Heat Setpoint	1	N	90	40F – 96F	40F – 96F
34	Min Cool Setpoint	1	N	60	43F – 99F	43F – 99F
43	Remote Sensor 1 Node Number	1	N	0	0-252 0= Disabled	0-252 0= Disabled
46	Remote Sensor 1 Temperature	1	N	0		n/a

Config Parameter #	Description	Length (bytes)	Send Unsolicited on change	Default Value	Read values	Write values
48	Internal Sensor Temp Offset	1	N	0	-7 to 7	-7 to 7
49	R1 Sensor Temp Offset	1	N	0	-7 to 7	-7 to 7
61	Fan Purge Heat	1	N	0	0-90	0-90
62	Fan Purge Cool	1	N	0	0-90	0-90
170 0xaa	Send Association Autosend with ACKs	1	N	1	0 = Send with no ACK request 1 = Send with ACK request	0 = Send with no ACK request 1 = Send with ACK request
171 0xab	Number of Heat Call Starts	4	N	0	0-0x7FFFFFFF	0-0x7FFFFFFF
172 0xac	Number of Cool Call Starts	4	N	0	0-0x7FFFFFFF	0-0x7FFFFFFF
173 0xad	Reboot Count	4	N	0	0-0x7FFFFFFF	0-0x7FFFFFFF
174 0xae	CPU runtime (sec) (battery mode only)	4	N	0	0-0x7FFFFFFF	n/a
175 0xaf	Autosend Wakeup count	4	N	0	0-0x7FFFFFFF	0-0x7FFFFFFF
176 0xb0	UI Wakeup count	4	N	0	0-0x7FFFFFFF	0-0x7FFFFFFF
177	Reserved					
178 0xb2	Power Status Bits are set according to power setup.	1			POWER_BATTERY 0x01 POWER_24VAC 0x02 PWR_ACINSTALL 0x10 PWR_BATINSTALL 0x20 PWR_FLIRS 0x40	n/a
179 0xB3	Battery Bank Voltage (%)	1	N		0-100	n/a
181 0xB5	Battery (%) Stat Shutdown threshold	1		0	0-50	0-50
182 0xB6	Battery (%) Radio Cutoff threshold	1		20	10-50	10-50
183 0xB7	Battery (%) Low Battery Indicator threshold	1		30	20-75	20-75

Config Parameter #	Description	Length (bytes)	Send Unsolicited on change	Default Value	Read values	Write values
184 0xB8	Battery (%) Threshold value for Midlevel	1		50	50-80	50-80
185 0xB9	Battery Report Timer (days)	1	N	1	0 = Disabled, 1 – 10	0 = Disabled, 1 – 10
186 0xBA	Temperature Delta Autosend Threshold (how many degrees change from the last autosend)	1	N	1	1-5 (degrees)	1-5 (degrees)
187 0xBB	Periodic Temperature Send Interval (min)	1	N	0	0 = Disabled, 1 – 120	0 = Disabled, 1 – 120
188	reserved					
189	reserved					
190	reserved					
194 0xC2	RH Delta Autosend Threshold (how many percent change from the last autosend)	1	N	5	1-50 (percent)	1-50 (percent)
195 0xC3	Periodic RH Send Interval (min)	1	N	0	0 = Disabled, 1 – 120	0 = Disabled, 1 – 120
196	Reserved					
198	Reserved	4	N		n/a	
221	Rutime-Stage1 Heat (sec)	4	N	0	0-0x7FFFFFFF	0-0x7FFFFFFF
222	Rutime-Stage2 Heat (sec)	4	N	0	0-0x7FFFFFFF	0-0x7FFFFFFF
223	Runtime-Aux Heat (sec)	4	N	0	0-0x7FFFFFFF	0-0x7FFFFFFF
224	Rutime-Stage1 Cool (sec)	4	N	0	0-0x7FFFFFFF	0-0x7FFFFFFF
225	Rutime-Stage2 Cool (sec)	4	N	0	0-0x7FFFFFFF	0-0x7FFFFFFF
226	Runtime-Fan Only (sec)	4	N	0	0-0x7FFFFFFF	0-0x7FFFFFFF
227	Runtime-Standby (sec)	4	N	0	0-0x7FFFFFFF	0-0x7FFFFFFF
230	reserved					
231	Status Display(0 displays RH on status line, 1 displays setpoints)	1	N	1	0,1	0,1

¹ Removed.

² Removed.

- ³ Config Parameters can be selectively Enabled to be Sent Unsolicited by setting the appropriate bits in the AutoSend Config Register #23
- ⁴ Any change to a Mechanical System setting may cause the current HVAC operation to abort and start a MOT
- ⁵ A MOT/MRT change will not take effect until the next MOT or MRT cycle
- ⁶ The battery alert enable only applies to the periodic battery report (config reg 185) and not the built-in battery threshold alerts (config regs 183, 184)
- ⁷ Schedule Enable (#38) must be enabled prior to setting this parameter
- ⁸ A zero setting causes backlight to be always on. This option is only available when using AC Power